Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A virtual pressure sensor for a Common Rail injection system of an endothermic engine, the injection system ~~comprising:~~ having at least one fuel pressure accumulating tank, of the rail type, having an input in fluid communication with a high-pressure pump and a plurality of outputs for feeding corresponding injectors ~~by using~~, the sensor comprising a pressure regulating means connected ~~and depending on~~ to an electronic control unit~~, and which includes a fluid-dynamic model of said accumulating tank to estimate and to obtain~~ that estimates fluid pressure in the accumulating tank and generates fluid pressure values, the pressure regulating means obtains the fluid pressure values and an injection law used by said electronic control unit and processes the fluid pressure values and injection law in accordance with a fluid-dynamic model to ~~for driving~~ drive the injectors of said Common Rail injection system and generate an estimated actual pressure value signal to the electronic control unit.

2. (Currently Amended) The virtual pressure sensor of claim 1 wherein the fluid-dynamic model of said accumulating tank provides models of sections of said accumulating tank and sections corresponding to said injectors~~.~~ and generates the estimated actual pressure signal in accordance with the following equation:

$$\frac{\partial^2 P}{\partial t^2} = c^2 \cdot \frac{\partial^2 P}{\partial x^2} + \frac{4}{3}\frac{\eta}{\rho} \cdot \frac{\partial^3 P}{\partial x^2 \partial t}$$

where:

P is the pressure in the rail 2;

η is a dynamic viscosity parameter for the fuel in the rail 2; and

ρ is the fuel density.

3. (Currently Amended) The virtual pressure sensor of claim 1 wherein said fluid-dynamic model of said accumulating tank enables the electronic control unit to calculate the fluid pressure value at each injector dynamically, while said endothermic engine is running.

4. (Original) The virtual pressure sensor of claim 1 wherein through the fluid-dynamic model, said accumulating tank is schematized in the pressure regulating means by a cascade of subsystems in fluid communication with one another, each subsystem comprises a first input terminal and first output terminal, as well as a second input terminal connected to said electronic control unit and a second output terminal arranged to supply a pressure value.

5. (Original) The virtual pressure sensor of claim 4 wherein said first input terminal of a first subsystem of said cascade of subsystems is connected to a bus interfacing to said electronic control unit.

6. (Original) The virtual pressure sensor of claim 5 wherein said second input terminals of said subsystems are connected to a demultiplexer, the latter connected in turn to said interfacing bus.

7. (Original) The virtual pressure sensor of claim 5 wherein said second output terminals of said subsystems are connected to a multiplexer, the latter connected in turn to said interfacing bus.

8. (Currently Amended) The virtual pressure sensor of claim 5 wherein said electronic control unit supplies said interfacing bus with a signal corresponding to ~~a~~ the fluid pressure value set by the accumulating tank and an injection law, and receives from it ~~a~~ the signal corresponding to ~~an~~ the estimation of the actual pressure in said accumulating tank at said injectors, as estimated by said fluid-dynamic model.

9. (Currently Amended) A common rail injection system for an endothermic engine, the injection system comprising:

at least one fuel pressure accumulating tank coupled to at least one injector;

a pressure regulating means coupled to an electronic control unit and to each at least one injector, the pressure regulating means ~~configured with a fluid-dynamic model of the accumulating tank to estimate and to obtain~~ receiving an injection law and a pressure signal from the electronic control unit corresponding to estimated fluid pressure values in the accumulating tank and generating therefrom an estimated actual pressure signal in accordance with a fluid-dynamic model that ~~are~~ is transmitted to the electronic control unit for driving the at least one injector.

10. (Currently Amended) The system of claim 9, further comprising an interface bus coupling the electronic control unit to the at least one injector, the electronic control unit configured to supply the interfacing bus with a signal corresponding to a pressure set by the accumulating tank and ~~an~~ the injection law, and to receive from the interfacing bus ~~a~~ the estimated actual pressure signal corresponding to an estimation of the actual pressure in the accumulating tank at the injectors as generated in accordance with the fluid-dynamic model.

11. (Currently Amended) The system of claim 10 wherein the ~~electronic control unit is enabled by the~~ fluid-dynamic model of the pressure regulating means ~~to dynamically~~ uses the following equation to calculate the estimated actual pressure value of each injector while the endothermic engine is running~~.~~:

$$\frac{\partial^2 P}{\partial t^2} = c^2 \cdot \frac{\partial^2 P}{\partial x^2} + \frac{4}{3}\frac{\eta}{\rho} \cdot \frac{\partial^3 P}{\partial x^2 \partial t}$$

where:

P is the pressure in the rail 2;

η is a dynamic viscosity parameter for the fuel in the rail 2; and

ρ is the fuel density.

12. (Currently Amended) A pressure regulating system for a common rail fuel injection system of an endothermic engine having at least one fuel pressure accumulating tank of the rail type coupled to a plurality of injectors, the accumulating tank having an input in fluid communication with a high-pressure fuel pump and a plurality of outputs for feeding fuel to the corresponding injectors, the pressure regulating system comprising:

an electronic control unit;

an interface coupled to the electronic control unit; and

a plurality of pressure ~~regulator models~~ regulators, each pressure regulator ~~model~~ coupled to the interface and to a respective injector, the pressure regulator ~~model~~ configured with a fluid-dynamic model of the accumulating tank ~~to estimate and to obtain~~ that receives from the electronic control unit an injection law and dynamic fluid pressure values that are transmitted via the interface bus and that generates therefrom an actual pressure valve to the electronic control unit via the interface bus for driving the plurality of injectors.

13. (Currently Amended) The system of claim 12 wherein the electronic control unit is configured to supply the interfacing bus with a signal corresponding to ~~a~~ the dynamic pressure set by the accumulating tank and ~~an~~ the injection law, and to receive from the interfacing bus ~~a signal corresponding to an of the actual pressure of the accumulating tank at the injectors~~ the actual pressure signal.

14. (Original) The system of claim 13 wherein each injector is in fluid communication with other injectors and comprises a first input terminal and a first output terminal, a second input terminal coupled to the electronic control unit and a second output terminal configured to supply a pressure value to the interface bus.

15. (Currently Amended) A pressure regulating system for a common rail fuel injection system of an endothermic engine having at least one fuel pressure accumulating tank of the rail type and a plurality of injectors coupled to the accumulating tank for receiving fuel therefrom, the pressure regulating system comprising:

an electronic control unit;

an interface bus coupled to the electronic control unit for bi-directional communication;

a plurality of pressure ~~regulator models~~ regulators, each pressure regulator ~~model~~ coupled to a respective fuel injector, ~~and~~ each fuel injector except a first fuel injector in fluid communication with other injectors, and each fuel injector coupled to the interface bus and configured to generate ~~an~~ a pressure estimation signal on a first ~~pressure~~ output that is transmitted to the interface bus for use by the electronic control unit in driving the injectors, a first input terminal coupled to the interface bus for receiving ~~a current~~ an injection law from the electronic control unit, a second input terminal configured to receive a signal from a preceding fuel injector except the first fuel injector, and a second output terminal coupled to ~~another~~ a succeeding fuel injector and configured to deliver pressure signals to the ~~other~~ succeeding fuel injector except for the last fuel injector;

the interfacing bus having an output coupled to ~~a~~ the second input terminal of the first fuel injector to receive ~~a~~ an actual pressure signal from the electronic control unit ~~corresponding to a~~ through the interface bus that is calculated from an estimated fuel pressure ~~set by~~ in the accumulating tank and ~~an~~ the injection law ~~that is also received at the first input of each injector.~~ in accordance with a fluid-dynamic model by operation of the following equation:

$$\frac{\partial^2 P}{\partial t^2} = c^2 \cdot \frac{\partial^2 P}{\partial x^2} + \frac{4}{3}\frac{\eta}{\rho} \cdot \frac{\partial^3 P}{\partial x^2 \partial t}$$

where:

P is the pressure in the rail 2;

η is a dynamic viscosity parameter for the fuel in the rail 2; and

ρ is the fuel density.

16. (Currently Amended) The system of claim 15 wherein the first input of each pressure injector is coupled to the interfacing bus via a ~~multiplexer~~ demultiplexer.

17. (Original) The system of claim 15 wherein the first output of each injector pressure regulator is coupled to the interfacing bus via a multiplexer.

18. (Original) The system of claim 15 wherein the fluid dynamic model of the accumulating tank is configured to generate models of sections of the accumulating tank and sections corresponding to each of the plurality of injectors.

19. (Original) The system of claim 15 wherein the fluid-dynamic model of the accumulating tank is configured to enable the electronic control unit to calculate the pressure value of each injector dynamically while the endothermic engine is running.